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TWENTIETH ANNUAL REPORT 1946

CENTRAL STATES
FOREST EXPERIMENT STATION
Columbus 13, Ohio
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TWENTIETH ANNUAL REPORT

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1946

INTRODUCTION

Extension of the forest survey to the Central States region 1/, the establishment of two new research centers, and the organization of a Forest Utilization Service unit highlighted the activities of the Central States Forest Experiment Station during the calendar year 1946.

The war years brought to the American public an awareness of the overall forest situation of this country. High-quality lumber and plywood were almost impossible to obtain. Even pulpwood and fuelwood were scarce. The largest supplies of quality timber were concentrated in the West where transportation cost to consuming centers was great. By war's end the man on the street began to realize that the Nation's woodpile had been seriously depleted during the emergency. The need for rehabilitating our forest resources was emphasized by press, radio and other informational media. Publicity given to wartime research, especially that on the atom bomb, also stimulated a popular appreciation of the value of research results in everyday life. This appreciation was extended to forest research.

1/ In this report the Central States region will include Iowa, Missouri, Illinois, Indiana, Ohio and Kentucky--the six States served by the Central States Station.

Immediately following termination of the war, Congress authorized a substantial increase in forest research activity throughout the country. The resulting expansion was reflected to a marked degree in the program of the Central States Forest Experiment Station. Funds for the Station, which had operated on a very modest scale since its establishment in 1927, were approximately tripled. This significant expansion of forest research in the Central States territory was due in part to a realization of the importance of the region's forests, as shown by the American Forestry Association's Appraisal and the Forest Service Reappraisal reports, and in part to recognition of the fact that previous research efforts have been inadequate in relation to the size of the territory and the number and complexity of its forest problems.

Funds for initiating the forest survey in the Central States region became available on July 1. This survey is a part of the Nationwide study of forest resources authorized by the McSweeney-McNary Forest Research Act of 1928. The objective is to obtain and keep current statistics on forest area; timber volume, growth and rate of cut; losses from fire, insects and diseases; and the probable future requirements for timber and other forest products. The initial forest survey of Washington, Oregon, the Lake States and parts of Idaho, Montana, the South and Southeast, were completed prior to the war. Extension of the survey to the Central States, and to other sections of the country not previously covered, was delayed due to suspension of activities during the emergency.

Advance planning on a national scale, the return of experienced survey men from military service, and advance training of

supervisory and other key personnel in new survey techniques developed during the war, greatly facilitated the organization of survey units at this and other Experiment Stations where new work was to be undertaken. The survey organization at this Station was recruited largely from returning veterans, many of whom had special training in photo interpretation and allied fields while in service. There was little delay in preparing plans and getting field work under way in this territory.

The survey will meet a real need in the Central States region. Accurate, up-to-date information on the forest resources of the States of the territory has been largely lacking in the past. This lack of reliable data has handicapped the development and expansion of major industries dependent upon the forest for a continuous supply of raw material, and has hindered the planning of long-range forestry programs aimed toward more nearly balancing the timber budgets of the various States. It is hoped that the survey can be continued on the fiscal year 1947 scale until all States of the region are covered, and that adequate provision can be made to keep the data current.

Coincident with initiation of the forest survey, the Station took preliminary steps toward activation of its first two forest research centers--one in Iowa and one in southern Illinois. Funds for the establishment of these two branch stations became available on July 1. The next six months were largely devoted to recruiting personnel, selecting headquarters, establishing offices, purchasing needed supplies and equipment, inspecting and selecting experimental areas, planning and making needed physical improvements, making an analysis of the problems of the territory served, and formulating

research programs.

The outstanding feature of the work center pattern of research organization, which originated in and has proved so successful in the South, is on-the-ground concentration of effort on the solution of the major forest problems of a distinctive forest province, regardless of State lines or other political subdivisions. Moreover, in the research center organization there is a minimum of functionalism. All available talents, skills and techniques are integrated and brought to bear in a concentrated attack on problems which must be solved to remove obstacles to progress in forestry in the territory served. Another important feature of the research center program is provision for cooperation with local timberland owners, industry, State and other Federal agencies. Problems of mutual interest, which are best solved by a joint approach, are attacked, so far as possible, on a cooperative basis. In addition, it is the general policy to form a research center advisory committee made up of local leaders in forestry and related fields. Such a committee provides an enlarged base of local experience, directs attention to problems and conditions which might be overlooked, and greatly assists in the development of a program which is fully correlated with, and in no way duplicates, going work of other agencies.

Each research center has one or more experimental forests representative of the major soil and forest conditions of the territory. These serve as field laboratories where problems can be studied and successful practices demonstrated. They are the focal point of the research center program. When necessary to solve special problems, however, work is carried on elsewhere within the territory served by the branch station. Briefly stated, the primary objective of a

research center is to determine and demonstrate how to obtain maximum sustained production and income from all lands within the province for which forestry is the highest use.

The Station's Forest Utilization Service, together with the expanded study of strip mine reclamation, completed the first full year of operation during 1946. The strip mine work, which is well known in the territory, has been in progress for a number of years. It is an established project which expanded soon after increased funds were made available July 1, 1945. The Forest Utilization Service, authorized at the same time, is a new Station activity. Little progress was made during the latter half of 1945, due to inability to recruit qualified personnel. However, one forest products specialist was recruited for this activity early in 1946 and has carried on full time throughout the year. Other personnel were assigned to this work for shorter periods.

The Forest Utilization Service, known as F.U.S., is the field arm of the Forest Products Laboratory. Its units, consisting of two or three products specialists, are located at the several Experiment Station headquarters. Emphasis is placed on liasion between the Laboratory and wood-using industries. These men travel a good deal of the time and report to the Laboratory the problems of timber harvesting and processing that occur in their region, estimating the scope and urgency of each, and recommending appropriate study or action by the Laboratory. They also take directly to industry the findings of the Laboratory's research. In addition, F.U.S. personnel organize and give training courses in kiln drying, etc., for industry employees, conduct certain independent studies, and assume technical responsibility

for the utilization phases of the research center and other Station programs.

Although organization of the new projects mentioned above made unusually heavy demands on the Station during 1946, other long-standing and no less essential activities were carried on as in previous years. Continued were the silvicultural studies in Missouri, forest soil and planting experiments throughout the territory, and Norris-Doxey farm forestry projects carried on during 1946 in cooperation with the Ohio and Iowa Agricultural Experiment Stations. The Station also continued to collect current data on lumber production and stocks for all the Central States and Kansas and Nebraska, and cooperated with the Bureau of Census and the Tennessee Valley Authority in obtaining the 1945 production of lumber, lath and shingles in all States of the territory. In addition, the Forest Reappraisal Project again made heavy demands on Station personnel. One man spent the entire year on Reappraisal, and others were assigned to this work for shorter periods.

Results obtained during 1946 and plans for 1947 are discussed on the following pages. The discussion is organized according to Station technical division having primary responsibility for the work, with separate presentations for the branch stations and cooperative farm forestry projects.

FOREST ECONOMICS

A Division of Forest Economics was established for the first time at the Central States Forest Experiment Station in July 1946. Incorporated in this Division were such activities as regional economic studies, forest products requirements, production and supplies studies carried on in cooperation with the Civilian Production Administration, cooperation with the Bureau of Census on the 1945 census of lumber production, and forest survey. In addition, the Division cooperates with the Forest Utilization Service and the Forest Management Division on phases of their programs which involve determination and evaluation of costs and returns, and has technical responsibility for the economic aspects of the research center programs.

Regional Economic Studies

The modest program of economics research carried on at this Station prior to the war was entirely suspended for the duration of the emergency. Funds and personnel were diverted to activities more directly connected with National defense. On July 1, 1946, however, funds were again made available for forest economics research in this territory, and work was started soon after activation of the new Division. Efforts during the remaining six months were largely directed toward reviewing past work, analyzing the problems of the region, deciding priorities and developing plans for future research in forest economics.

Plans for 1947 include a study of the comparative costs of harvesting, concentrating, transporting and handling woods and mill

wastes to be used in making building felt, corrugating board and similar products. The industries which make these articles offer an important and expanding market for waste wood because they are able to use low-quality material of many species without removing the bark. If it is determined that waste wood of many classes, including inferior species and standing cull trees, can be produced cheaply enough through mechanization, improved methods, or otherwise, then the utilization of such waste may be greatly increased.

One of the greatest obstacles to good forest management in the Central States is the problem of finding uses and markets for the cull and low-grade trees which, as a result of continued high-grading, make up a large part of the volume in the region's woodlots. This inferior material is occupying space that should be stocked with valuable species of good form, quality and vigor if each acre is to produce the yield and income of which it is potentially capable. Production of quality material is likely to remain low unless and until ways and means can be found for removing at a profit the low-grade material which now predominates in the region's forests.

The timberland owner needs to know the costs and returns involved in improvement cuttings in deteriorated stands, the comparative returns from stands of different size classes and the relative merits of growing trees to different sizes before harvesting. Logging contractors and consumers of wood need better information on the costs and returns involved in harvesting, concentrating and hauling various classes of material with different equipment and methods. The Division of Economics will work with industry, the F.U.S., the Laboratory and the research centers in seeking the answers to these and other important questions.

A condensation of the Worthington and Kirkland manuscript, "The Function of Woodlands in Cornbelt Farming," prepared just previous to the war, will be completed and issued as a Station technical paper during 1947.

Forest Products Requirements, Production and Supplies

With working funds provided by the Civilian Production Administration, the Station continued to provide data on lumber production and lumber stocks on hand in the Central States region. Monthly estimates were prepared and submitted to Washington for incorporation into National estimates for the use of several reconversion agencies, notably those dealing with housing.

The estimates for this region showed the total monthly production of lumber by States, mill size classes, and principal species groups. Similar reports were prepared showing stocks of lumber at the mills and in concentration yards. In addition, a monthly estimate of railroad tie production was made. Besides being valuable during the period of control and allocation of lumber supplies, these figures provided the Station with a picture of the sawmilling industry in this territory which was very useful in planning other research.

The estimates were based on monthly reports from about 1,000 representative sawmills in the States of Ohio, Indiana, Illinois, Iowa, Kansas, Nebraska, Missouri and Kentucky. In the most important timber-producing States, the error of estimate averaged within 5 percent, plus or minus, of the probable production. The sample mills were selected to represent all types of mills in the region. They ranged in size from small farm mills operated a few days each year for farm needs to well-equipped mills producing high-quality lumber and graded

products. Most of them, however, were portable mills producing timber, ties and rough lumber.

In addition to the lumber production and stock estimates, a monthly report was prepared on the factors affecting lumber production in the North- and South-Central Hardwood regions. This report was based on observations of the field force, supplemented by current information obtained from mill operators throughout both regions regarding the effect on production of such factors as weather, manpower, equipment and supplies, costs, prices, raw materials, markets, Government regulations and management policies.

Lumber production in this territory during 1946, spurred by extremely heavy demand, and aided by unusually favorable weather conditions, exceeded the 1945 cut by roughly 50 percent.

The seller's market created by short supply and heavy demand caused a tremendous increase in the number of active mills. Commencing early in the year, the active small mill population, those cutting less than 1,000 M board feet annually, increased constantly throughout the summer due to the addition of numerous reconditioned mills and every conceivable jumble of equipment that could possibly rip a log into lumber. These small mills cut 86 percent of the area's total production, much of which was poorly manufactured material which normally would have little value as graded lumber. Heavy production continued through the fall months favored by ideal weather, slow but constant improvement in the general labor and equipment situations, and strong markets for all materials.

Late in 1946 the production trend was reversed. The normal seasonal reduction in construction work lowered the demand for building

materials. Winter weather greatly reduced the quantity of accessible stumpage, and also created new labor and equipment problems, especially in the woods. While the market for quality materials remained strong, the demand for green, mis-cut lumber slackened immediately. Many of the poorly-equipped small mills stopped operations for the winter.

Present plans call for a continuation of the estimates and the "Factors" reports until the middle of 1947. By that time supplies of the products of these mills should be such that continued monthly estimates will be unnecessary.

1945 Census of Lumber, Lath and Shingle Production

The Bureau of Census, the TVA and the U. S. Forest Service cooperated in collecting 1945 lumber, lath and shingle production data in Ohio, Kentucky, Indiana, Missouri and Illinois. The data obtained showed production by major species for each State, geographic region and Office of Price Administration region.

The survey in the Central States was divided into two parts. First was a complete canvass of all large mills, meaning all mills that produced over 400 M board feet in 1942, except Kentucky where large mills were those which produced 3 million board feet or more in 1942. Second was an area sample of smaller mills. The small mill sample areas consisted of whole counties and all mills within a sample county were canvassed. This procedure resulted in the canvassing of one-third of the regional area, one-half of the total number of mills, and 80 percent of the total regional production.

The locations of mills contacted were marked on county road maps, using symbols denoting type and volume of product. These maps may serve as a basis for future surveys. They also were used by the checkers who systematically spot-checked the work of the enumerators in the field.

Forest Service field men edited all reports before submitting them to the Station for compilation. They kept accomplishment records, as did the office personnel, showing time and cost data. These records were useful in determining the efficiency of alternative survey designs.

Forest Survey

The forest survey was officially started in the Central States territory in July 1946, although some preliminary planning work had been done prior to that time. Following the national pattern of covering the most important timberlands first, the decision was made to begin in Missouri. This was before the transfer of the Appalachian section of Kentucky from the Southeastern to the Central States Station's territory. It was further decided that the inventory should proceed State by State in order of priority.

The objectives of the survey in Missouri were to determine:

1. The forest area by counties, large physiographic units and the whole State.
2. The timber volumes, in board feet and cubic feet, for at least three major divisions (the Ozarks, the prairie, and the Missouri-Mississippi River bottomlands). These volumes were to be expressed

by stand-size classes, species and diameter classes.

3. The growth rate in board feet and cubic feet.

4. The rate of timber drain from cutting, fire, insects, disease and other causes.

A working plan for the State of Missouri was prepared, and a trial of the procedure made in one Missouri Ozarks county. The plan was revised as a result of experience gained in the field trial. A field force of seven men and a photo interpretation crew of four technicians and a draftsman were assembled. A photo interpretation school established at the Columbus office trained all new personnel in the use of aerial photographs for maps as well as for the determination of forest area and stand data. Facilities of this school were also made available to personnel of the Regional Office, some of the National Forests and various private organizations.

By the end of the year, field inventory crews had covered four million acres of land, including 2.8 million acres of forest. At the same time the photo interpreters, keeping a little ahead of the field crews, had covered about four million acres of forest land. No computations of field data were made during 1946. Field studies have provided form factors, average log lengths, standards of utilization, approximate cull factors and other basic data needed in the preparation of volume tables.

A working plan to secure timber drain information for Missouri was prepared. Lumber drain was to be based on RPS figures for lumber production in 1946. Field checks were planned to determine the volume of lumber, fuelwood, fence posts and other forest products used

for domestic consumption and for industrial purposes, and to provide factors for estimating woods and mill waste.

The forest inventory of Missouri will be completed by the fall of 1947. The inventory of Illinois will begin immediately thereafter and should be completed in about six months.

A generalized forest-type map for Missouri will be prepared. Area and volume computations for the State will be 80-90 percent finished by the end of 1947, and the growth computations about 50 percent completed. Statistical reports on the Eastern Ozarks section will be assembled and published early in 1948. These will be final reports for that section but much of the data will be included in a more comprehensive report for the whole State, to be published later. Field work and computations for timber drain in Missouri will be completed in 1947.

FOREST MANAGEMENT

The Forest Management Division is responsible for spoil banks reclamation studies and research in silviculture, planting and forest soils. In addition, the Division has technical responsibility for the forest management phases of the research center and other Station programs. In accordance with Congressional directive, the majority of forest management funds allotted to the Station are used for spoil banks research.

Spoil Banks Reclamation

Spoil banks research was greatly expanded at this Station with funds made available by Congress on July 1, 1945. During the latter part of 1945 and early 1946 considerable time was spent in defining the problem; consulting with the coal industry, State Departments of Conservation and the Agricultural Experiment Stations; assembling available information and planning a well-rounded attack on this problem; and in initiating a region-wide reconnaissance survey of stripped coal lands. Information assembled from various sources, together with field observations and the results of laboratory analysis of bank and high wall samples, made in cooperation with the State universities, provided a basis for evaluating and classifying stripped lands according to their potentialities for supporting trees or other vegetation.

During 1946 emphasis was placed on: (1) the reconnaissance of strip-mined lands, (2) the establishment of experimental plantations on stripped areas in Alabama and Ohio, and (3) a study of the

older plantations on spoil banks in Illinois and Indiana. Except during the spring planting season, field personnel devoted most of their time to reconnaissance work. The objective was to determine the location and extent of stripped areas and to classify the banks on the basis of characteristics which are known or appear to affect survival and future development of planted trees.

Approximately 76 percent of the total reconnaissance job was completed during the year. In addition to other information, potential stripping areas, as delineated by coal outcrop lines, were determined and located on the reconnaissance maps. This work was greatly facilitated by maps supplied by cooperating coal companies, and by the use of aerial photographs.

The following table shows by States the estimated acres stripped, and the percent of area thus far covered by reconnaissance.

State	Estimated acres stripped	Percent completed
Ohio	32,000	90
Indiana	24,000	10
Illinois	34,000	100
Kentucky	12,000	0
Missouri	25,173	100
Kansas	25,498	100
Oklahoma	8,319	100
Alabama	9,000	100
Arkansas	5,000	0
Iowa	1,000	0
Total	175,990	76

Experimental plantings totaling approximately 75 acres were established in Ohio and Alabama during the spring of 1946. These plantings included studies of: (1) adaptation of species to different bank conditions, (2) mixtures of species, (3) the effects of leveling banks on survival and growth of trees, (4) methods of planting, (5) use of fertilizers to stimulate early growth, (6) underplanting of decadent locust stands on banks, and (7) direct seeding of hardwood and pine species. Two important responses of planted trees were noted at the end of the first growing season. First, it was observed that trees planted with the planting bar on spoil banks gave as good survival and growth the first year as those planted with the mattock. Since bar planting is not only easier but faster than mattock planting, use of this more efficient method would do much to speed up and cheapen the difficult job of foresting stripped lands. The second, and perhaps the most significant observation, was that leveling spoil banks, as required by the State of Ohio, reduces both survival and growth of planted trees. Elimination of leveling would do much to reduce the overall cost of spoil banks reclamation.

Completion of all reconnaissance work in the region and the initiation of large-scale planting experiments in Ohio, Illinois, Indiana, Missouri, Kansas and Oklahoma are planned for 1947. Work plans are already drawn up for some of the planting studies, and others are in the process of development. Data obtained from the reconnaissance survey and the planting studies will be summarized in a regional report scheduled for completion during 1947. This report will include information on the area and location of strip-mined lands, their suitability for reforestation, the results of planting studies, and recommendations for the reclamation of banks of various types and conditions.

Forest Soils

During the year a paper entitled "Forests for Old Fields" was prepared for publication in the 1943 - 1947 Yearbook of Agriculture. This paper emphasized the soil characteristics of abandoned farm lands in relation to reforestation. It pointed out that in reforesting lands unfit for agricultural crops, soil conditions should be given primary consideration in selecting tree species to plant on a given site. Otherwise survival is uncertain and growth problematical.

Considerable time was spent in training field men in the recognition of chemical and physical properties of soils on areas stripped for coal. A knowledge of these properties is essential to the classification of spoil banks according to their potentialities as planting sites for various tree species.

A survey was initiated of some 100 plantations established during the past 20 years by coal companies, State Departments of Forestry and other agencies in Illinois and Indiana. This study of older plantations provided valuable information on the behavior of various tree species on different kinds of spoils, and contributed much to the basis of our spoil bank classification system.

Silviculture

Silvicultural work during the year included assistance in the development of programs at the research centers, the preparation of papers for publication and the remeasurements on going studies.

Technical Papers 105, "Response of Planted Shortleaf Pine to Overhead Release," and 106, "The Range of Shortleaf Pine in Missouri," were released during the summer. Paper 105 summarizes

the response of planted shortleaf pine to different intensities and types of release at intervals after planting, and stresses the importance of coordinating needed planting, harvest cutting and improvement cutting on a given area into one overall action program. Paper 106 consists of a map showing the range of natural shortleaf pine in Missouri and a brief discussion of factors affecting the range and distribution of this species.

A brief description of a sectional measuring pole for measuring tree heights was also published during the year. With this pole it is possible to measure tree heights as great as 35 feet to an accuracy of one-tenth of a foot at the rate of about 60 trees per hour.

Another remeasurement was made on areas included in a study of the practicability of direct seeding as a means of increasing the stocking of shortleaf pine in low-grade oak-hickory stands in the Missouri Ozarks. Results showed continued high survival and growth rate of the seedlings.

Plans for 1947 call for further assistance in the development of research center programs and for continuing, and where possible completing, going silvicultural studies in Missouri.

FOREST UTILIZATION SERVICE

A Forest Utilization Service unit of two men began active work at the Station during March 1946, following a training session of five weeks at the Forest Products Laboratory in Madison. One member of the unit specializes on utilization problems encountered by producers of primary forest products such as logs, lumber, ties, staves and veneers. The other devotes attention to problems of wood processing, remanufacturing and fabrication. The member assigned to primary industries left the Station shortly after the first of November, leaving the F.U.S. unit on a one-man basis during most of the last quarter.

The Forest Utilization Service is essentially a consulting and advisory field arm of the Forest Products Laboratory. Its purpose in Central States territory, in common with that of the F.U.S. units previously established at six other Stations, is to strive for maximum utilization of forest resources as an economic aid to attainment of better forest practices throughout the region. Along with other activities, F.U.S. personnel have technical responsibility for the wood utilization phases of the research center and other Station programs.

The first step toward organizing a Forest Utilization Service work program in the Central States area was a series of conferences with State forestry and conservation officials, forest school leaders, extension foresters, National Forest administrative personnel and others interested in forest utilization matters, concerning the utilization problems of the region. It was generally agreed that the major problems

in order of priority are: (1) the many low-grade trees left standing on cutting areas to the detriment of the future stand, (2) the large volumes of sound material left in the woods as waste after logging, (3) high costs of harvesting and conversion common to small operations, (4) too little use of local timber by local industries, (5) non-recovery at small mills of full potential quality and volume yields from logs in general, (6) enormous waste in the manufacture and remanufacture of lumber and many other wood products, and (7) lack of profitable uses for small round material that should be thinned out for stand improvement.

Primary Industries

From frequent contacts of Station personnel with the sawmilling industry, principally in connection with cooperative work for the Lumber Division of the War Production Board during the war years, the troubles of the Central States sawmill operators and loggers are fairly well known. The majority need practical advice and field demonstrations particularly with respect to: (1) available mechanized harvesting equipment, (2) the proper installation, alinement and operation of portable sawmills, (3) labor-saving devices for use at small mills, (4) sawing practices to minimize waste, and (5) log and lumber grading rules. New, low-priced equipment needs to be designed specifically for small-scale loggers and lumber producers, who greatly predominate in the Central Hardwood region.

A considerable amount of preliminary work was done in the spring in an effort to start a Farm Bureau cooperative association integrated logging - sawmilling - remanufacturing enterprise in northern Ohio. Region 9 Division of State and Private Forestry

cooperated in these preliminaries. The project was finally shelved indefinitely by the Coop's Board of Directors largely because of the exorbitant cost of dry kilns and other new equipment needed, and the impossibility of having equipment orders filled for 10 months or longer.

Many sawmills, veneer mills and handle factories were visited in Ohio, Indiana and Missouri, and problems discussed with the managers or owners. In general, they were all so busy during 1946, and the market was so ready to absorb any wood products produced, regardless of quality, that most operators were not overly enthusiastic about making any changes in the status quo. Their main difficulties were labor and equipment shortage. However, some took immediate action on suggestions by F.U.S. for improving efficiency of operation. All others were glad to receive suggestions and published Laboratory information for future reference when better efficiency would become essential to successful operation on a buyer's market.

Secondary Industries

The Station has not had previous working contracts with the region's wood processing, building, remanufacturing and fabricating industries even faintly approaching those maintained with primary producers. Moreover, very little organized information concerning these industries is obtainable from other sources. It was necessary, therefore, to start from scratch in analyzing the technological problems of the thousands of industrial users of wood outside the category of primary industries. It was decided that the best means of obtaining a reasonably quick general perspective of these problems was to conduct a schedule of personal visits to representative individual establishments

throughout the region. Circumstances, including loss of personnel, prevented visiting the approximately 250 plants scheduled for 1946 contacts, but enough calls were made to prove the value of conducting this phase of problem analysis by the personal-visit system. It is the best possible way to become acquainted with the numerous kinds of wood-using industries in the region, to acquaint industry with Station, F.U.S. and Laboratory activities, and to obtain notes for later reference in arranging local cooperative studies and pilot plant operations. Most of the difficulties being encountered at the various establishments already visited could be overcome by application of techniques developed from past research at the Forest Products Laboratory. Scores of processed reports on various subjects were requested and sent by the Laboratory to the industrial establishments as a result of visits by F.U.S. representatives. Gluing and seasoning problems were found to be far more frequent than all other problems combined.

Considerable time was spent in organizing field courses in the kiln drying of lumber to be conducted by Laboratory technicians. Two courses were scheduled and will be held early in 1947. Sponsors are the Chicago Furniture Manufacturers Association and the Rockford Furniture Manufacturers Association, both in Illinois.

Field tests made by F.U.S. of the SCR-6260 Army mine detector were highly successful. Deeply embedded spikes, nails and wire were located in walnut and other species of logs and flitches. In response to many inquiries, a source of supply of surplus mine detectors was located and made known to those interested. A set of instructions for using the apparatus commercially as a locator of metal in timber is scheduled for publication in January 1947.

A large concern in the region requested information on local supplies of wood waste for a change from straw to wood as a raw material for its corrugating board plant. F.U.S. cooperation included field contacts to ascertain the amount and kinds of waste available at several furniture plants, and an office estimate of potential supplies of coarse sawmill and logging waste. The latter was based on forest reappraisal and lumber census data. Preliminary test runs using factory and sawmill waste were made at the Fiber Products Laboratory, Springfield, Ohio, and at the Forest Products Laboratory. Other inquiries regarding the preparation of mechanical and semi-chemical fiber from local hardwoods were received and answered by F.U.S.

The F.U.S. unit cooperated with the Laboratory in locating suitable mills for log grade studies conducted during 1946 by a laboratory crew in the Central States region.

Plans for 1947

Plans for F.U.S. activities during 1947 include the following, in addition to the routine job of furnishing technical information and advice to miscellaneous correspondents and callers:

1. Preparation of an article on metal detector for trade journal publication, including recommended procedure for its commercial use at sawmills and veneer mills.
2. Continuation of analysis of industrial wood utilization problems in all parts of the region

by making personal calls at many individual plants, including the furnishing of technical information already available and applicable to problems encountered at the time of F.U.S. visits.

3. Wood harvesting and transportation studies in cooperation with the Forest Products Laboratory, the Central States Station research centers, Division of Economics and other agencies, both public and private.

4. Improvement of small sawmill equipment based largely for the present on demonstrations of improved practices and equipment.

5. The development of log grades and tree grades applicable to the Central States region.

6. Field observations and preparation of specific recommendations for studies in the utilization of low-grade and defective trees and woods waste.

7. Same as item 6 above relative to the utilization of black-jack oak in Missouri.

8. Field observations on the use of mine timbers by Central States coal producers and preparation of plans for studies of supply sources and preservative treatment.

9. Advise research center personnel in Iowa and Illinois regarding installation of plants for demonstrating open tank preservative treatment of posts for local use.

10. Assist the Laboratory in organizing a class for a course in the kiln-drying of staves to be given preferably at the Forest Products Laboratory.

11. Cooperate with the Missouri State Division of Resources and Development in attaining their declared objectives of developing paper and fibre board industries and otherwise using the State's forest resources to a better advantage.

12. Encourage establishment of rural wood-utilization industries and provide technical advice pertinent to their installation and operation.

BRANCH STATIONS

Carbondale Research Center

The Carbondale work center was established for research on timber growing and related problems in Illinois and comparable forest areas in adjacent States. The total area served is 42.4 million acres, of which 5.2 million acres, or 12 percent, are forested. Included in the research center province are: Illinois, except for five counties in the northwest, thirteen counties in southwestern Indiana, seven counties in western Kentucky and eight counties in the bootheel section of southeastern Missouri. Although not homogeneous, the territory served by the Carbondale branch has many important similarities, and includes a fairly distinctive section of the Central Hardwood region.

The northern or prairie section of the province is characterized by rich soils, intensive agriculture and a concentration of industries in such urban communities as Chicago, Peoria, Moline and Rock Island. Small, scattered farm woodlots make up the forests of this section. Corn-hog agriculture and industry dominate the economy, and the trend is toward a decrease in forest acreage. In the southern half of the province the soils are poorer, there are fewer industries, and the topography is more rugged, especially the Ozark Uplift sections of southern Illinois and western Kentucky. Here forestry plays a much more important role in the local economy. This part of the province contains most of the timber. Approximately 3.8 million acres (19 percent of the area) are now in forest, and there are an additional 3 to 6 million acres of potential forest land. The current trend is

toward larger and more stable forest ownerships and an increase in total forest acreage.

Farm woodlands comprise 88 percent of the forest land in the province as a whole. These woodlots average about 40 acres in size. They are generally smaller in the prairie section than in the southern part of the province. Except for the Shawnee National Forest and the State Forests and Parks, there are very few sizeable forest ownerships. There are about 1,400 sawmills in the province, largely concentrated in the southern part, three-fourths of which are small and produce less than 500 M board feet of lumber annually. In 1942 these mills produced a total of 205 million board feet of lumber. Between 1942 and 1946 production increased an estimated 60 to 70 percent.

The principal forest type of the province is oak-hickory, which occurs on the upland flats and dry hills. Bottomland species, including willow, cottonwood, soft maple and elm, are found in the river bottoms; in the coves and valleys are mixed hardwoods of yellow poplar, cucumber, beech, maple, ash, oaks and gums. Most of the second-growth hardwood stands which make up the forests of the province have been seriously depleted through frequent heavy cutting, overgrazing and lack of protection from fire. They are generally understocked and contain a high proportion of culls and inferior species. Less than one farmer in twenty manages his woodland in conformity with good forestry principles. Perhaps the greatest need is to determine and demonstrate how to rehabilitate these woodlands and increase yields and financial returns up to their full potential.

From a forestry standpoint, the chief advantages of this territory are: nearness to consuming centers, excellent markets for

a wide range of forest products, fine transportation facilities, an abundance of high-quality hardwood species and climate and forest sites capable of producing a high annual yield of valuable wood products. Under proper management the forests of the province, especially the southern part, could make a very important contribution to the local economy.

Headquarters for this branch station were established in the Post Office Building at Carbondale, Illinois, in the southern part of the research center province, soon after funds became available on July 1. The selection of this location was in line with a decision made in consultation with local forestry leaders to concentrate in the more heavily forested southern portion of the territory for the immediate future. Another consideration was proximity to the Kaskaskia Experimental Forest, in Hardin County near Elizabethtown. This tract, a part of the Shawnee National Forest, was set aside as an experimental area in 1942. Previous to that time some improvements were made, including construction of two dwellings, a warehouse-garage, a pumphouse and 12.5 miles of roads. However, because of inadequate financing and the war, the area was never fully developed or operated as an experimental forest.

The nucleus of a research center staff was recruited before the end of the year. Their efforts during the latter part of 1946 were expended largely in making an analysis of the forest situation in the province served, and in developing plans for a research program aimed at the solution of the territory's major forest problems. In addition, considerable development and improvement work was done

on the Kaskaskia Experimental Forest. Buildings were reconditioned, base lines for compartment and plot boundaries were laid out, a complete road system planned, old cruises were checked and new maps prepared, including an aerial mosaic of the tract.

Ames Research Center

The territory served by the Ames branch includes all of Iowa and comparable areas of southeastern Minnesota, southwestern Wisconsin, northwestern Illinois and northern Missouri. The research center province totals some 49.3 million acres, of which 6.2 million acres--12.6 percent--are forested. It is estimated that an additional one to one and one-half million acres are better suited to forestry than any other use, and should be planted to trees.

This territory is ordinarily thought of as a vast and relatively uniform expanse of gently rolling agricultural lands capable of producing 100 or more bushels of corn per acre. It is true that rich, deep prairie soils predominate, and that probably a higher percentage of the land area is under intensive cultivation than in any other section of the country of comparable size. However, there are several million acres of rough lands in the unglaciated sections of northeastern Iowa, and in the Mississippi bluffs, which are unsuited to cultivation. These areas are rather heavily forested, and in them the current trend is toward an increase in forest cover. In addition, there are the bottomlands, where cultivation is risky because of the constant threat of flooding, and a considerable acreage of marginal agricultural lands in southern

Iowa and northern Missouri for which the highest use remains to be determined.

The major forest type in the research center province is oak-hickory. Minor types include northern hardwoods, stream margin and swamp hardwood forests. In this province, more than any other major section of the Central States territory, forestry is almost entirely a farm woodlot proposition, with shelterbelts and protection forests very much in the picture. Over 98 percent of the timber is in small private ownerships. There are only two sizeable privately owned tracts, and publicly owned forest lands amount to less than 60,000 acres. In Iowa alone the gross value of forest products sold or used on the farm is estimated at $14 million annually. There are some 1,200 sawmills in Iowa, which produce around 73 million board feet of lumber a year, and 450 wood-using industries. These figures would increase by about 50 percent for the province as a whole.

Although the economy of the province served by the Ames branch is dominated by corn-hog agriculture, with industry as a secondary source of employment and income, there are relatively large sections of the territory in which the forest resources, if developed, could make an important contribution to the local economy. One obstacle to progress in this direction seems to be a general lack of appreciation of the fact that the native timber can be managed as a crop to yield a continuous return; and that, unlike other agricultural crops, forests are capable of producing a substantial income from lands not suitable for other purposes. However, many agricultural

leaders and the majority of farmers are inclined to regard forests and potential forest lands as "waste," "ineffective," and "non-productive." There is relatively little reforestation under way in the territory, and not over one percent of the woodlands now have even fair forest management. Over-grazing and over-cutting are the rule rather than the exception. As a result, the woodlands of the province are currently producing less than 20 percent of the products of which they are capable.

On the encouraging side is the fact that war shortages awakened many of the people of this rich agricultural section to the importance of their local timber resources. The woodlots of the region were drawn upon heavily during the emergency for lumber for farm and other uses. Continued shortages, together with high prices, may stimulate further interest in and action toward conserving and developing the forest resources of the territory. And the recent floods, like the drought years, may be expected to rekindle interest in the reforestation of denuded areas in need of protection from wind and water.

One of the greatest needs at the present time is for technical knowledge on the proper methods of handling forest crops. Such information is essential to the achievement of improved management and increased production from the native timber. Ways of rehabilitating and improving the growing stock of the war-depleted woodlots must be determined, and successful practices convincingly demonstrated on the ground for the benefit of timberland owners interested in improving their forests. Research can remove further obstacles to progress in forestry by developing and demonstrating more efficient

methods and equipment for planting, and for the harvesting and utilization of forest products. The program of the Ames branch will be directed toward the solution of these and other major forest problems of the territory.

Headquarters for this branch station were established early in July at Ames, Iowa in offices provided by the School of Forestry, Iowa State College. The research center leader reported for duty on July 11, and other members of the staff were recruited within the next two months. The full research program will be developed cooperatively with Iowa State College and the Iowa Conservation Commission. Formal cooperative agreements with these two organizations have been prepared, and are awaiting final approval.

Efforts of the staff during the latter part of 1946 were largely directed toward defining the forest problems of the region and formulating plans for an attack on these problems. Considerable time was also devoted to the selection of experimental areas. Since publicly owned forest land is very limited, and sizeable private tracts practically non-existent, this proved to be a major undertaking. About every forest ownership of 1,000 acres or more in the entire province was inspected. As a result of this reconnaissance, negotiations were initiated with the Conservation Commission for the use for experimental purposes of about 2,000 acres of the Yellow River State Forest, in Allamakee County, 500 acres in Lee and Van Buren Counties, and an equal acreage in Lucas and Monroe Counties, near Chariton. Final arrangements for use of these areas should be completed early in 1947. In addition, preliminary arrangements were made with the Amana Society for cooperative studies on 400 acres of their timberlands in Iowa County.

COOPERATIVE FARM FORESTRY RESEARCH

Ohio Project

During 1946 a field study dealing with the facts which influence maple syrup production in northeastern Ohio was started in cooperation with Dr. O. D. Diller of the Ohio Agricultural Experiment Station. The purpose of this study was to determine: (1) characteristics of trees and environmental factors which influence quantity and quality of sap production as a basis for improving sugar bushes for syrup yields, and (2) income that can be obtained from syrup production. Under (1) syrup yields during the last two years were studied in relation to age and size of trees, density of stand, soil type and various other site factors.

The economic phases of the study (2) are being handled by the Department of Rural Economics of Ohio State University, under the direction of Professor H. R. Moore. In addition to income from syrup, these deal with supplemental income from other products of the land, such as forage and wood products for sale and for home use. They involve a study of the per-acre economic returns from farm sugar bushes on a labor income basis and on a capital investment basis.

Most of the field work has been finished. It is planned to complete the field work, compile the data and prepare a report during 1947.

Iowa Project

Work was continued on the log grade yield study initiated in Iowa a number of years ago under the supervision of Professor George B. Hartman. Field data are essentially complete, and during the year considerable progress was made on compilation and analysis. It is hoped that the final report can be prepared in 1947. However, this will depend to a large extent on Professor Hartman's teaching load, which has greatly increased with the increase in enrollment at Iowa State College.

Indiana Project

Results of the Indiana cooperative log grade yield study, completed prior to 1946, were published during the year in Purdue University Agricultural Experiment Station Bulletin No. 516.

STATION PERSONNEL

ADMINISTRATION

HAROLD L. MITCHELL, Director; _____, Secretary

BERNIECE D. DILLON, Administrative Assistant; Mary J. Prater, M. Ward Cramer, Beatrice R. Gibbs, Doris S. Koski, Louise G. Marple, Mary L. Posey, Virginia A. Schilling, Laura C. Sisk, Josephine Stauder, Alfred J. Apgar, Michael P. Agresta, Ruth M. Shawaker.

ECONOMICS DIVISION

ROBERT K. WINTERS, Chief; Virginia K. Tomlinson, Secretary, Alberta M. Hiatt, Grace L. Fluhart.

Survey

Inventory. -- Eugene V. Roberts.

Photo Interpretation. -- Karl E. Moessner, John E. Wiggins, O. Keith Hutchison, Kenneth L. Quigley.

Field Project, Waynesville, Mo. -- Maxwell E. Becker, August E. Block, Joseph L. Burkle, Paul F. Ehinger, Earl H. Hansen, Theodore J. Schmitt, Robert K. Train, Bonnie J. Williams.

Statistics. -- G. Luther Schnur.

Growth. -- G. Luther Schnur.

Drain. -- Ralph K. Day.

Drafting. -- Christy E. Hamm.

Resource Analysis. -- _____.

Regional Products Supplies Studies. -- Ralph K. Day, David B. King, Glen E. Kennedy, Albert C. Morley, Elliott W. Zimmerman, George M. Lang, Margaret K. Peirsol, Betty J. King, Robert A. Sharp, Francis E. Sherman, Geraldine M. Lough.

Financial Aspects of Forest Management. -- _____.

FOREST MANAGEMENT DIVISION

ARTHUR G. CHAPMAN, Chief; Jeanne F. Cowden, Secretary.

Silviculture. -- Franklin G. Liming, Leonard F. Kellogg.

Regeneration. -- Ralph H. Ahlskog, Gustaf A. Limstrom.

Urbana Field Headquarters. -- Room 330, New Agricultural Building, University of Illinois, Urbana, Illinois. Deane W. Mather.

Pittsburg Field Headquarters. -- Room 213, Music Building, Kansas State Teachers College, Pittsburg Kansas. Nelson F. Rogers, John E. Krajicek, Joseph C. Crofton, Marion E. Postlewaite.

Buffalo Field Headquarters. -- Buffalo, Ohio. Robert W. Merz.

Soils. -- John T. Auten.

FOREST UTILIZATION SERVICE

_____, Chief

Primary Industries. -- W. Harry Croke.

Secondary Industries. -- Marsden R. Brundage.

BRANCH STATIONS

CARBONDALE BRANCH. -- Post Office Building, Carbondale, Illinois. Leon S. Minckler, Cleo Caraway.

Kaskaskia Experimental Forest. -- Elizabethtown, Illinois. Donald L. Fassnacht, James J. Cann.

AMES BRANCH. -- c/o Forestry Department, Iowa State College, Ames, Iowa. E. Garth Champagne, Richard D. Lane, Calvin D. Maus, Barbara L. Ward.

COOPERATIVE FARM FORESTRY

OHIO PROJECT. -- P. T. Lannan, Karl S. Lindeman.

IOWA PROJECT. -- George B. Hartman.

PUBLICATIONS

(Including those of cooperators)

Printed Periodicals

Herrick, Allyn M. Grade yields and overrun from Indiana hardwood sawlogs. Purdue University Agricultural Experiment Station Bulletin No. 516, 1946.

Liming, Franklin G. A sectional pole for measuring tree heights. Journal of Forestry 44(7): 512-514. July 1946.

Minckler, Leon S. Old field reforestation in the Great Appalachian Valley as related to some ecological factors. Ecological Monographs 16: 87-108. April 1946.

_____ Northern Piedmont Experimental Forest. The Forest Farmer 5(12): 3-7. September 1946. (T. C. Evans, Senior author)

Processed Releases

Liming, Franklin G. Response of planted shortleaf pine to overhead release. Central States Forest Experiment Station Technical Paper No. 105, 20 pp. (Multilithed.) August 1946.

_____ The range and distribution of shortleaf pine in Missouri. Central States Forest Experiment Station Technical Paper No. 106, 4 pp. (Multilithed.) September 1946.

Minckler, Leon S. A guide for tree planting in the southwest Virginia counties in the Tennessee Valley. Southeastern Forest Experiment Station Technical Note No. 61, 1946.

_____ and A. A. Downs. Machine and hand direct seeding of pine and cedar in the Piedmont. Southeastern Forest Experiment

Station Technical Note No. 67, 1946.

RPS Staff. Monthly News Letter. Monthly, January to December, 1946.

Accepted for Publication

Auten, John T. Forests for old fields. U. S. D. A. Yearbook of Agriculture 1943 - 1947.

Minckler, Leon S. and A. G. Chapman. Tree planting on the farm. U. S. D. A. Farmer's Bulletin.

Moessner, Karl E. A crown density scale for photo interpreters. Journal of Forestry.

RESEARCH TERRITORY

OF THE

CENTRAL STATES FOREST EXPERIMENT STATION

FOREST SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE